FORMER NEBRASKA ORDNANCE PLANT

RESTORATION ADVISORY BOARD

April 24, 2007

Former Nebraska Ordnance Plant Restoration Advisory Board Meeting April 24, 2007

Introductions & Administrative Items	7:00-7:05
Agenda Review	7:05-7:10
Activities Since Last RAB Meeting	7:10-7:30
Groundwater Monitoring Program	7:30-8:00
Groundwater Model Update	8:00-8:15
Summary of Site Risks	8:15-8:45
Next RAB Meeting, Final Remarks	8:45-9:00

Introductions

- Community Co-Chair – Melissa Konecky
- Army Co-Chair – Garth Anderson
- Restoration Advisory Board (RAB) Members

Introductions – Community RAB Members

ACTIVE MEMBERS
Melissa Konecky (RAB Co-Chair)
John Wageman
Paul Randazzo

Introductions – Agency RAB Members

Lincoln Department of Water Resources
Lincoln Water System
Lower Platte North Natural Resource District, Larry Angle
Nebraska Department of Environmental Quality
Nebraska Health and Human Services System
Nebraska National Guard
Saunders County
University of Nebraska – Lincoln, Agricultural Research and Development Center
University of Nebraska – Lincoln, Environmental Health and Safety
University of Nebraska, Office of General Counsel
US Army Corps of Engineers, Garth Anderson (RAB Co-Chair)
US Army Reserve
US Environmental Protection Agency, Region 7, Scott Marquess

Administrative Items

Meetings are being recorded

- Cameras are being used to videotape this meeting
- Transcriptionist is present to record this meeting
- When you ask a question – state your name loudly and clearly for the transcriptionist to hear you
- One question at a time

Administrative Items

- **Mead Project Mailing List:**
  - **If you would like to receive site information from us, please use include your name and address on the sign in sheet**
- **Mead Project Web Site:**

http://www.nwk.usace.army.mil/projects/mead/projectindex.html

- **Email list. Email notifications when new information is posted on the web site. Please include on sign in sheet.**

Status Update

Activities Since last RAB Meeting

1. Baseline sampling of expanded monitoring well network
2. March 2007 sampling of Monitoring Wells (MW), Surface Water locations (SW), and Water Supply Wells (WSW).
3. Continued one-year evaluation of Load Line 1 extraction and treatment

Status Update

Documents Completed Since last RAB Meeting

1. Construction work plans for Advanced Oxidation Process pre-treatment system for EW-11
2. Submittal of 2006 Groundwater Model Report
3. December 2006 Quarterly Data Summary Report
4. December 2006 WSW, MW, & SW Quality Control Summary Reports

Planned Activities

- Quarterly sampling – June 07
- Extraction Well (EW) maintenance (EWs-1, 9, 10) – April 07
- Install remaining MWs pending property access
- Begin construction of EW-11 Advanced Oxidation Process system – May 07
- Direct-push investigation LLs 2 & 3 – May 07

Planned Activities

- Conduct OU2 Five Year Review
- OU3 Antimony soil removal Action Memo
- Ordnance & Explosives Recurring Review
- Update Community Relations Plan
- Annual Site Tour – June 21, 2007

GROUNDWATER MONITORING PROGRAM

Detailed results in December 2006 Data Summary Report

(Handout or on web site:

http://www.nwk.usace.army.mil/projects/mead/Sampling_Results.html)

Status Update - GMP

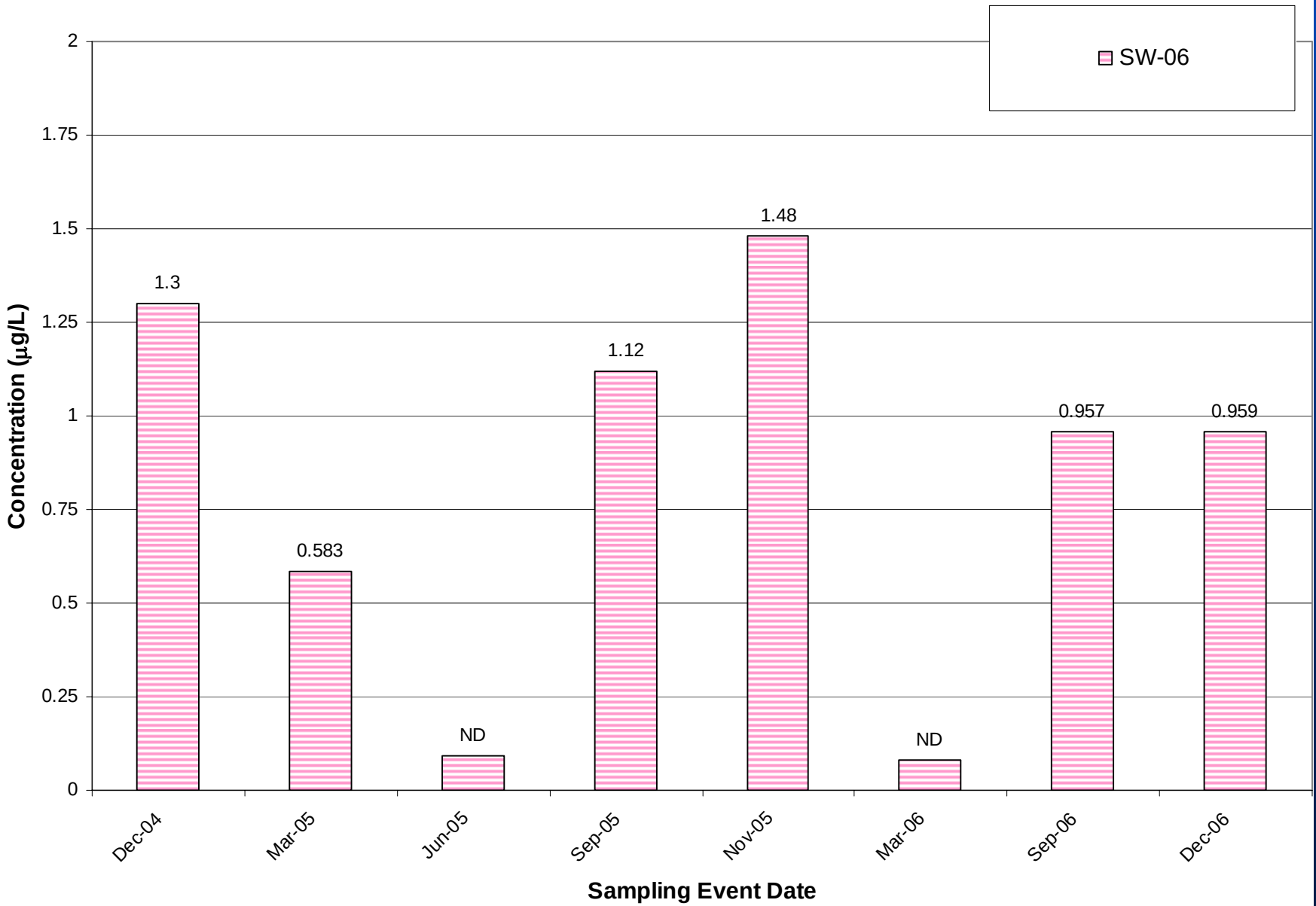
January 2007 New MW Baseline Sampling

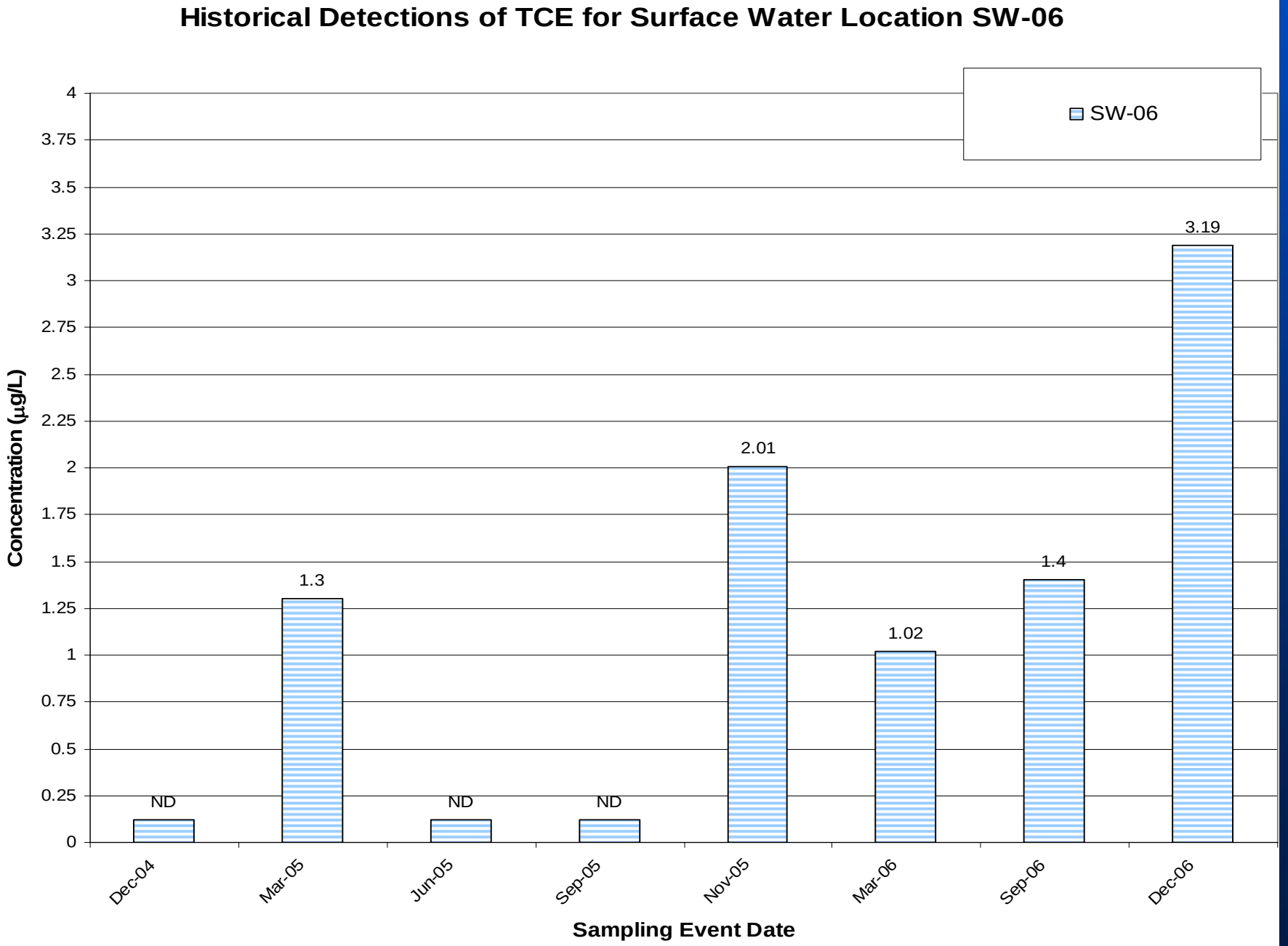
- Sampling Completed Feb 1, 2007
- 70 Monitoring Wells sampled
- Data Results Letters & Quarterly Data Report anticipated to be finalized in May 2007

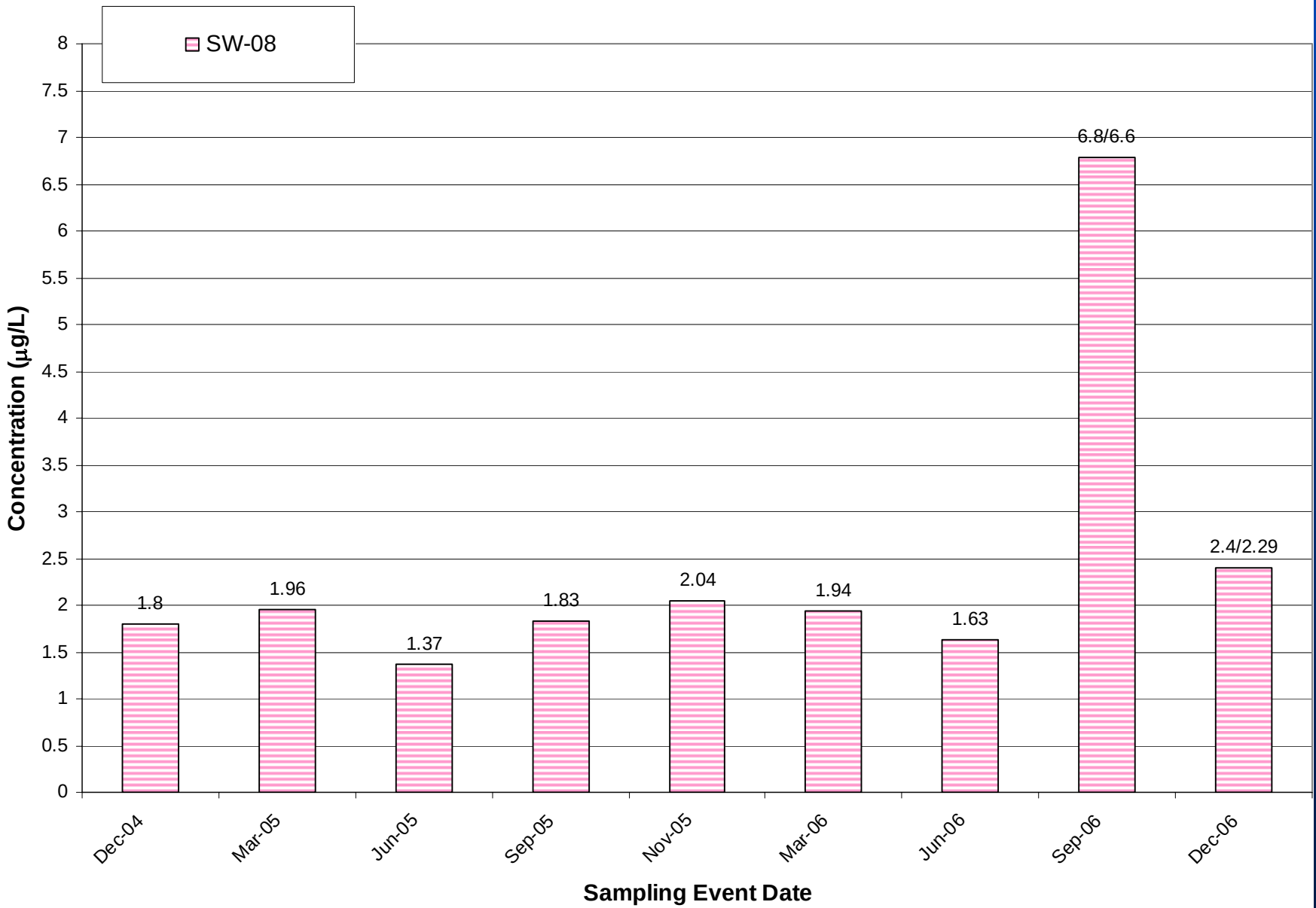
Status Update - GMP

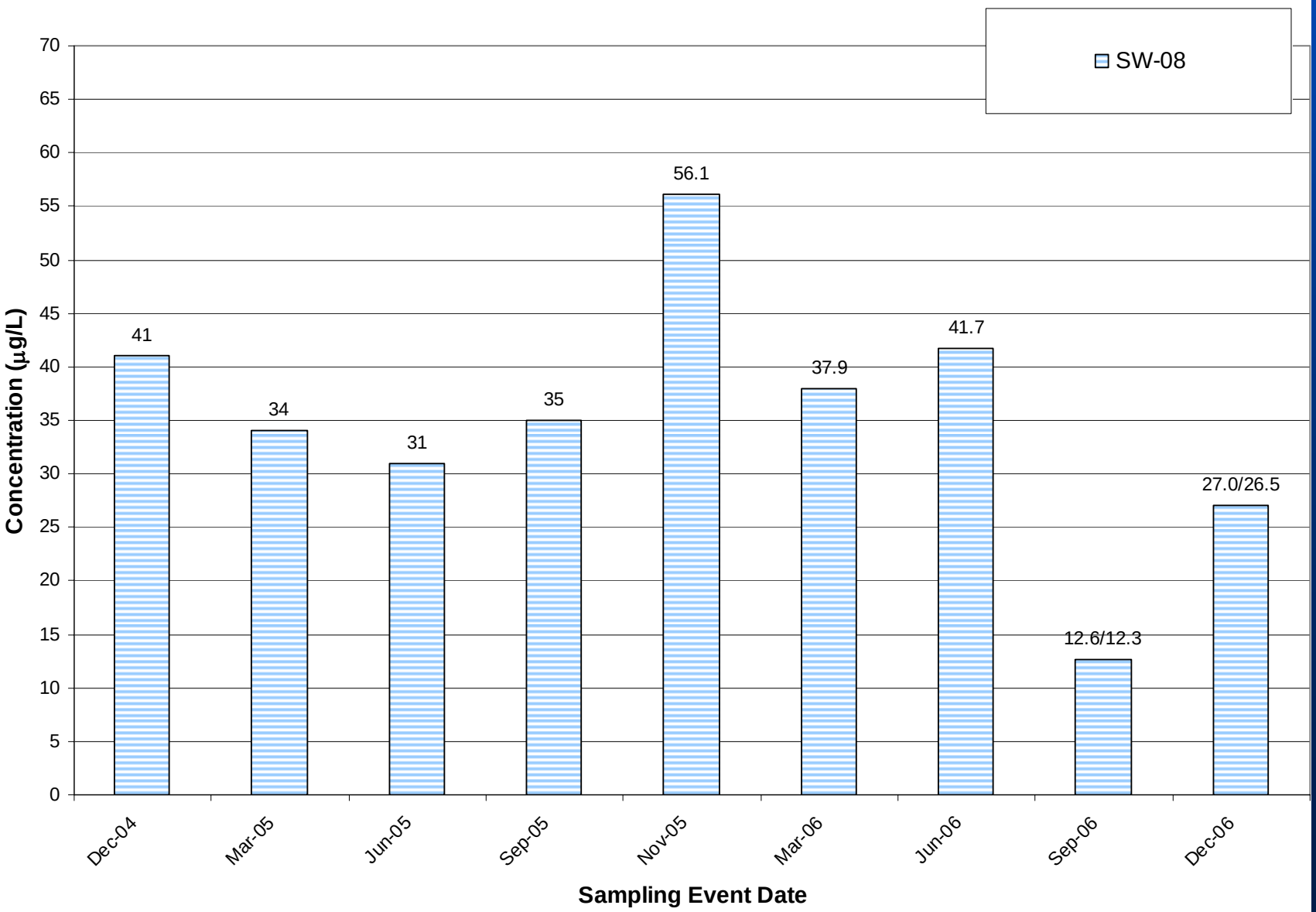
March 2007 GMP Sampling

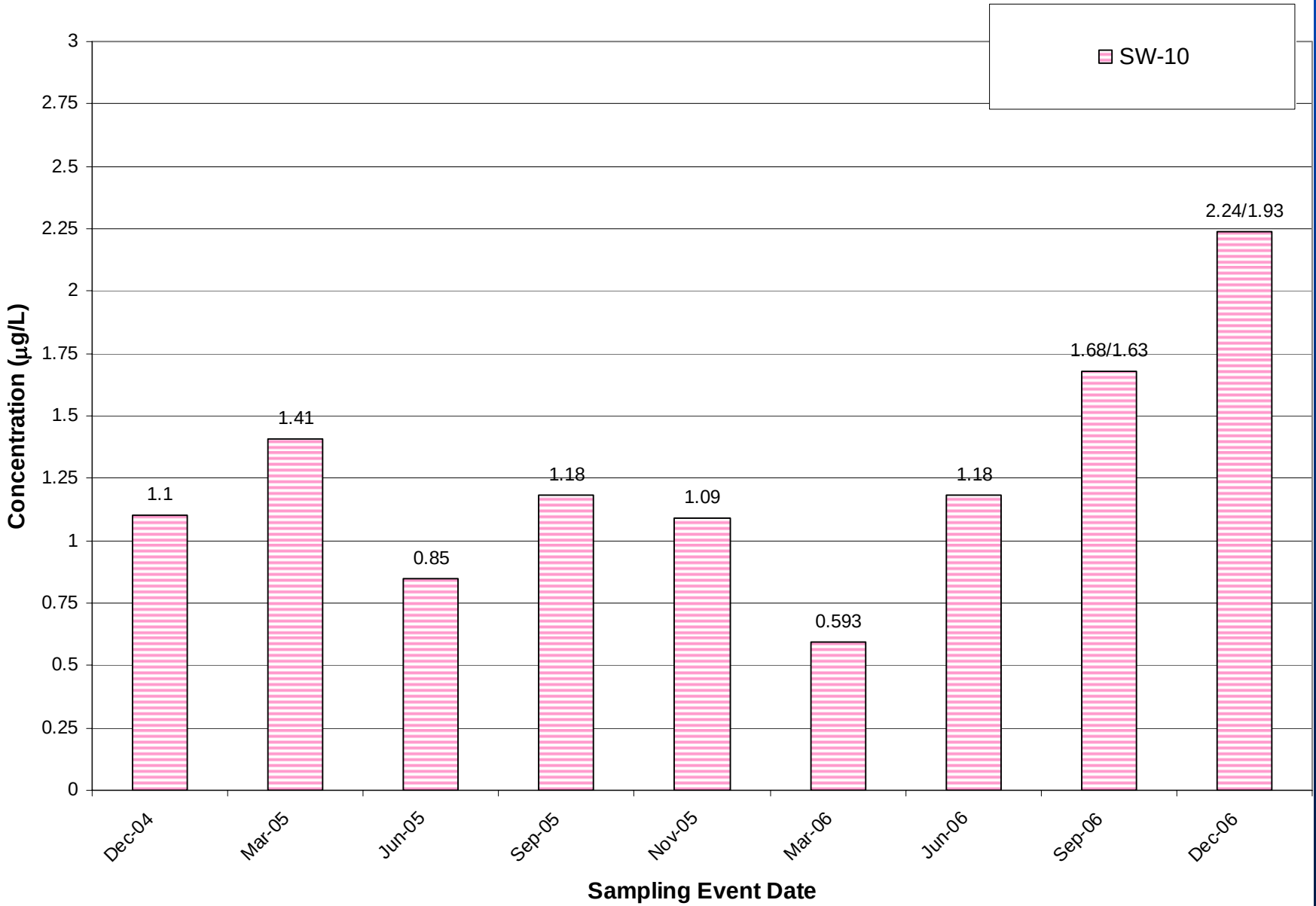
- Sampling Completed April 12, 2007
- 176 Monitoring Wells (MWs) sampled
- 35 Residential Water Supply Wells (WSWs) sampled
- 14 Surface Water (SW) Locations sampled
- Data Results Letters & Quarterly Data Report anticipated to be finalized in June 2007

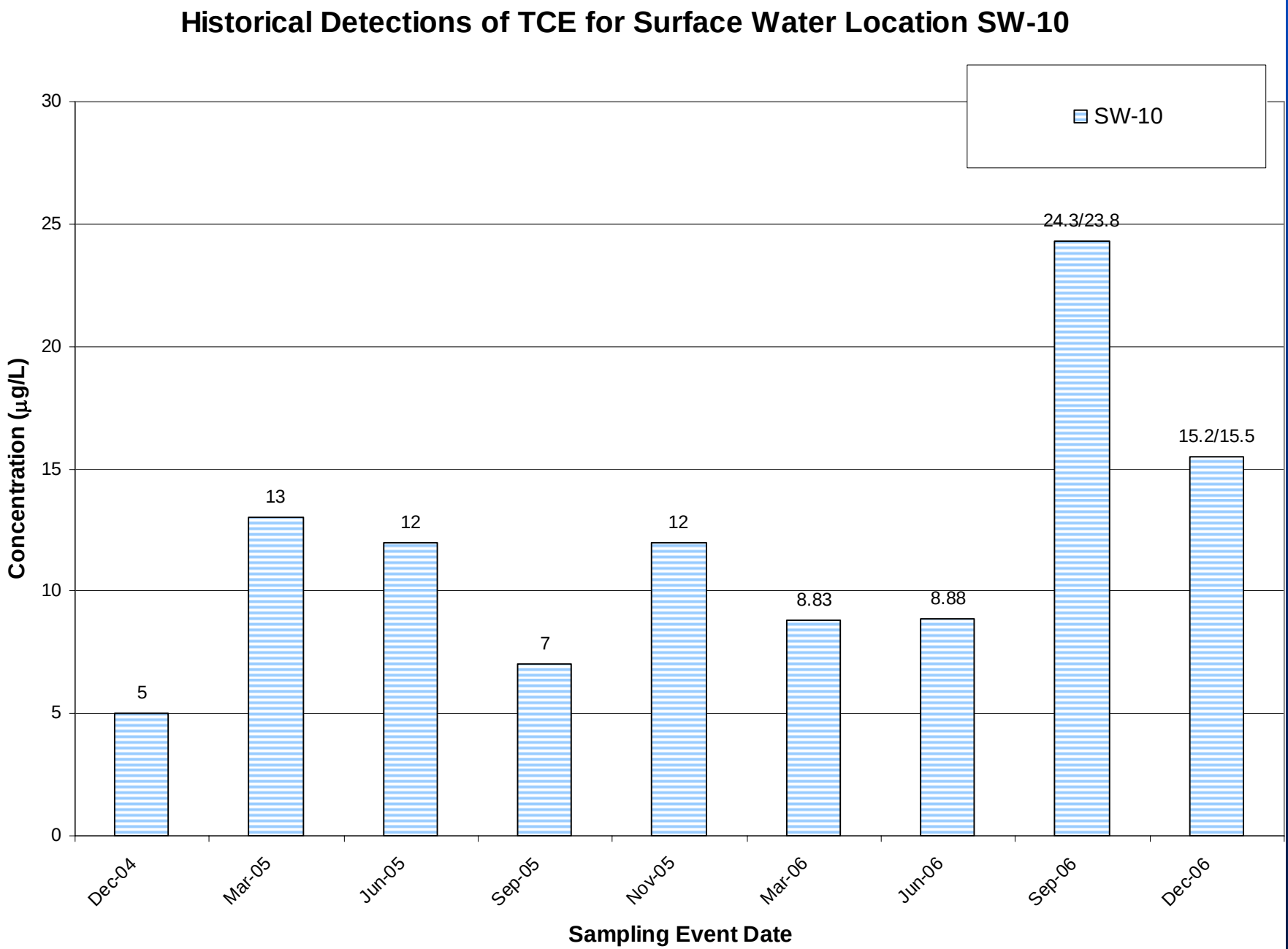

Historical Detections of RDX for Surface Water Location SW-06
SW-06
Concentration (µg/L)
2
1.75
1.5
1.25
1
0.75
0.5
0.25
0
1.3
0.583
ND
1.12
1.48
ND
0.957
0.959
Dec-04
Mar-05
Jun-05
Sep-05
Nov-05
Mar-06
Sep-06
Dec-06
Sampling Event Date

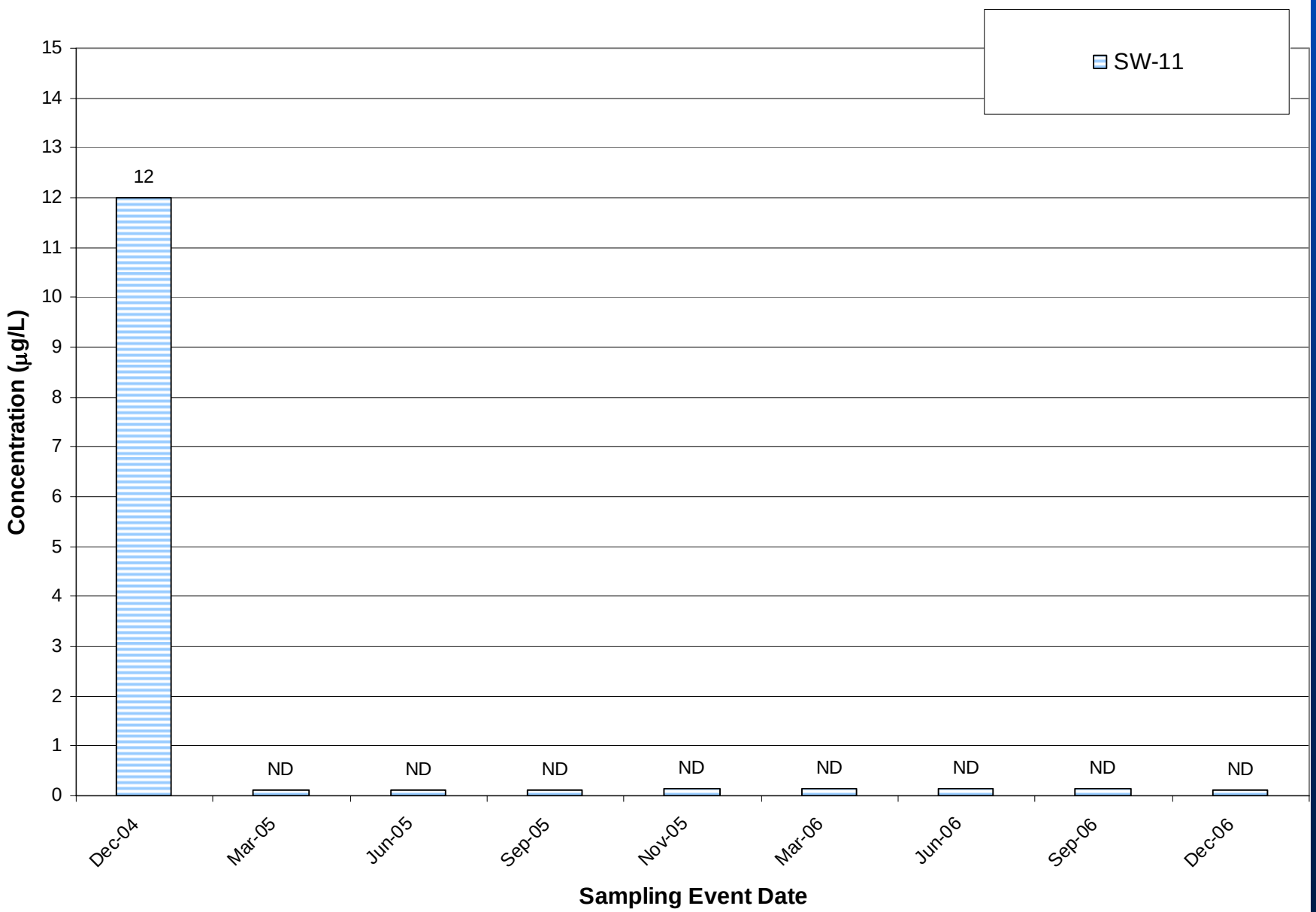

Historical Detections of TCE for Surface Water Location SW-06
SW-06
Concentration (µg/L)
4
3.75
3.5
3.25
3
2.75
2.5
2.25
2
1.75
1.5
1.25
1
0.75
0.5
0.25
0
ND
1.3
ND
ND
2.01
1.02
1.4
3.19
Dec-04
Mar-05
Jun-05
Sep-05
Nov-05
Mar-06
Sep-06
Dec-06
Sampling Event Date

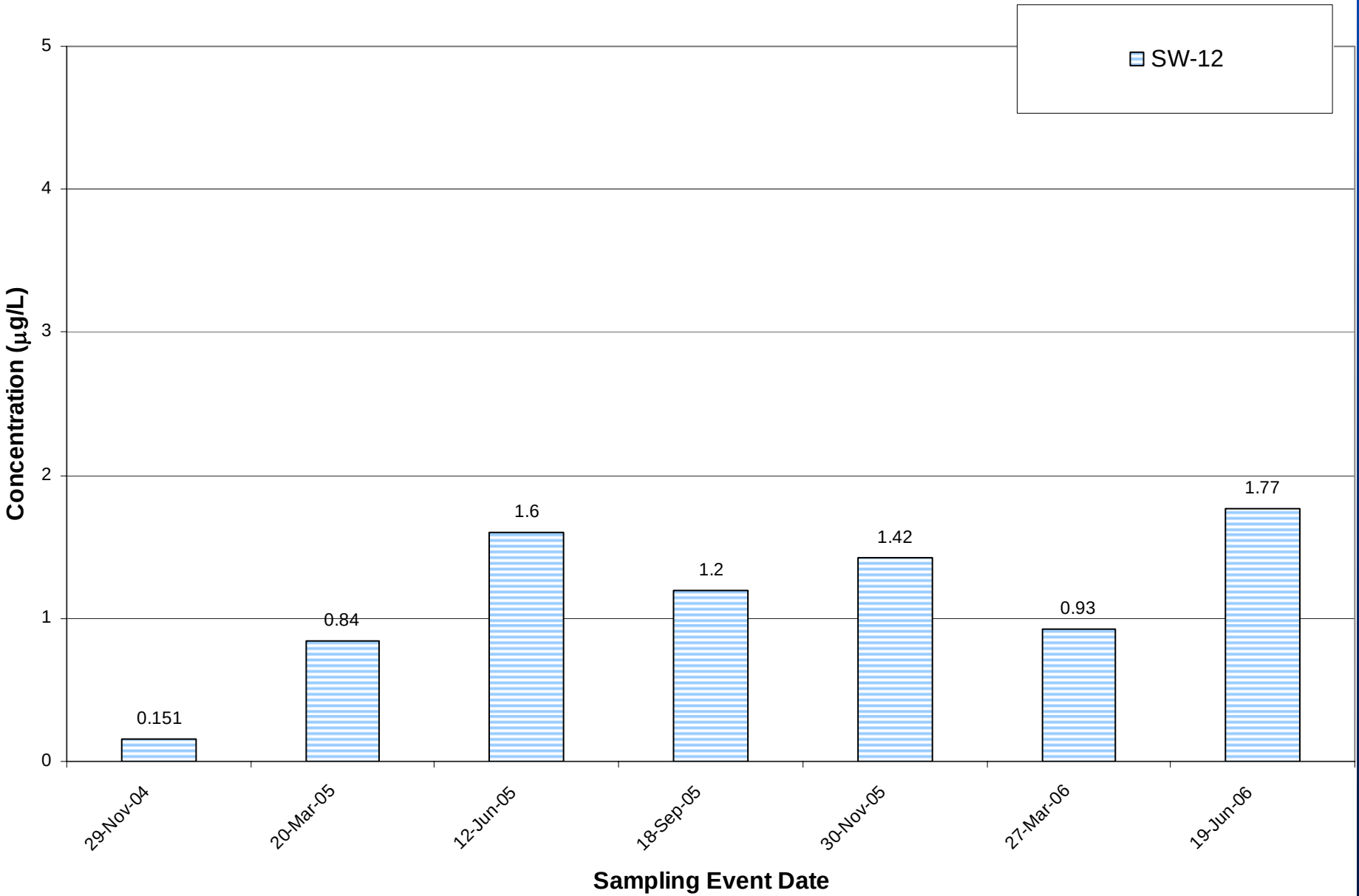

Historical Detections of RDX for Surface Water Location SW-08
SW-08
Concentration (µg/L)
8
7.5
7
6.5
6
5.5
5
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
1.8
1.96
1.37
1.83
2.04
1.94
1.63
6.8/6.6
2.4/2.29
Dec-04
Mar-05
Jun-05
Sep-05
Nov-05
Mar-06
Jun-06
Sep-06
Dec-06
Sampling Event Date

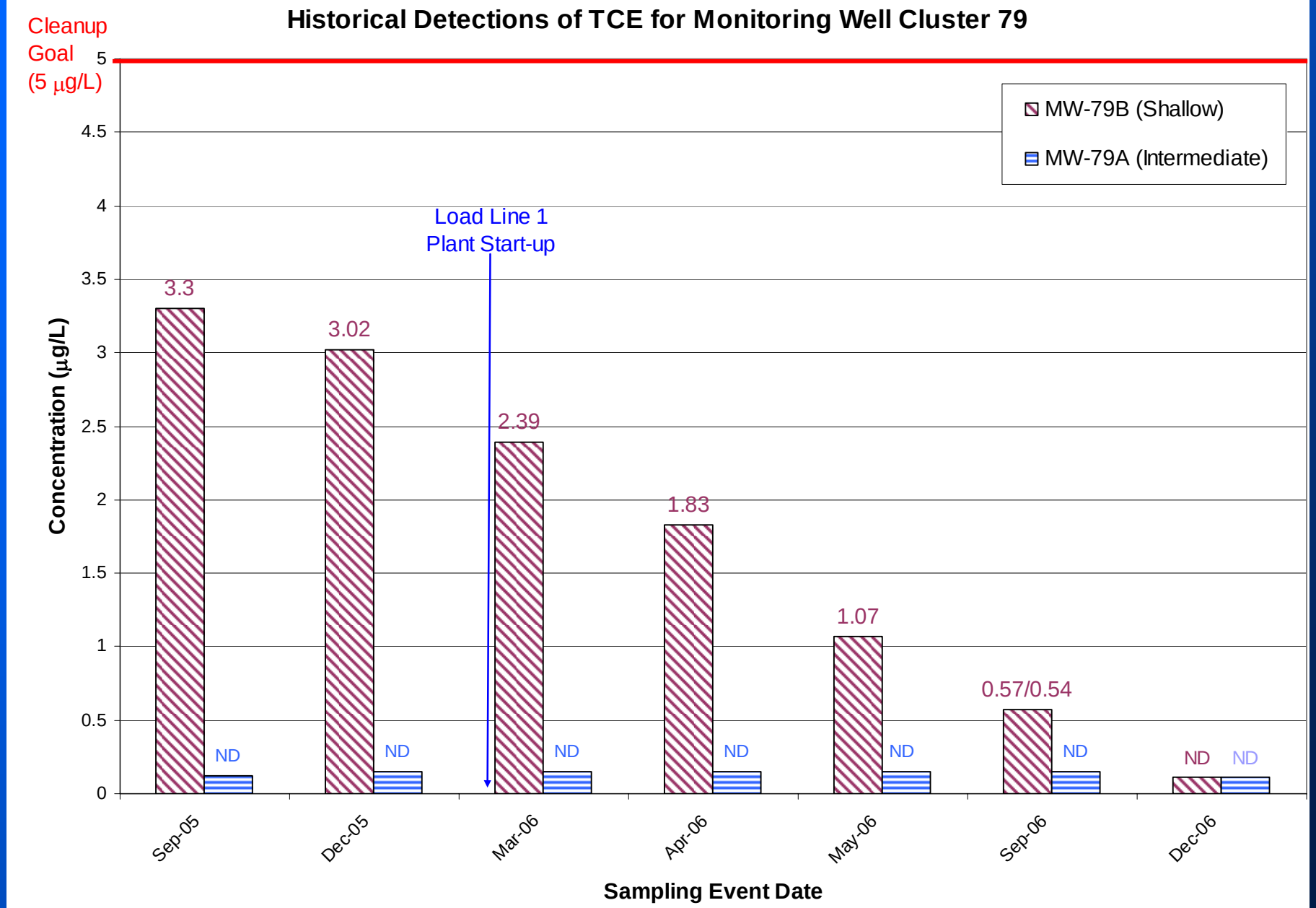

Historical Detections of TCE for Surface Water Location SW-08
SW-08
Concentration (µg/L)
70
65
60
55
50
45
40
35
30
25
20
15
10
5
0
41
34
31
35
56.1
37.9
41.7
12.6/12.3
27.0/26.5
Dec-04
Mar-05
Jun-05
Sep-05
Nov-05
Mar-06
Jun-06
Sep-06
Dec-06
Sampling Event Date


Historical Detections of RDX for Surface Water Location SW-10
SW-10
Concentration (µg/L)
3
2.75
2.5
2.25
2
1.75
1.5
1.25
1
0.75
0.5
0.25
0
1.1
1.41
0.85
1.18
1.09
0.593
1.18
1.68/1.63
2.24/1.93
Dec-04
Mar-05
Jun-05
Sep-05
Nov-05
Mar-06
Jun-06
Sep-06
Dec-06
Sampling Event Date

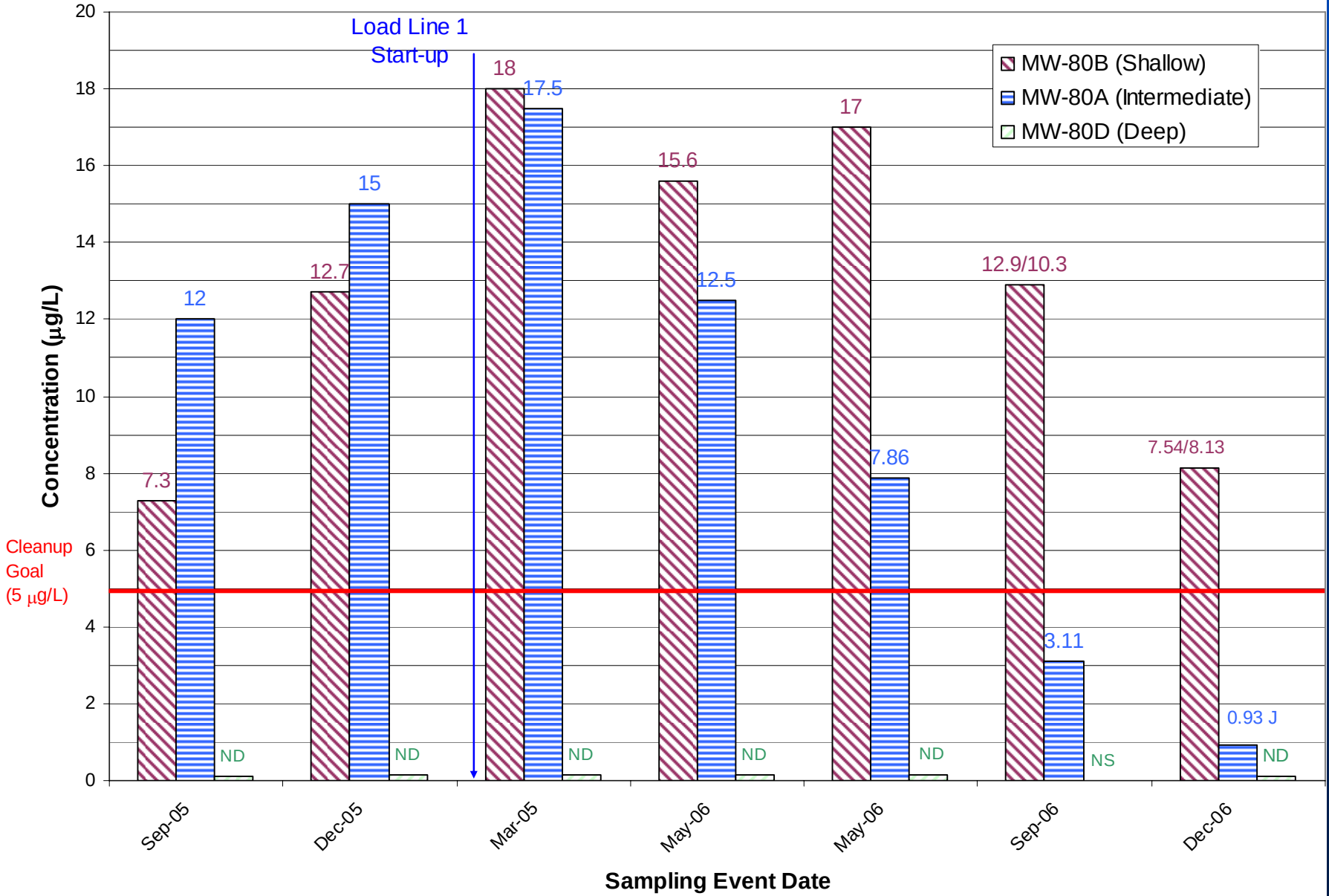

Historical Detections of TCE for Surface Water Location SW-10
SW-10
Concentration (µg/L)
30
25
20
15
10
5
0
5
13
12
7
12
8.83
8.88
24.3/23.8
15.2/15.5
Dec-04
Mar-05
Jun-05
Sep-05
Nov-05
Mar-06
Jun-06
Sep-06
Dec-06
Sampling Event Date


Historical Detections of TCE for Surface Water Location SW-11
SW-11
Concentration (µg/L)
15
14
13
12
11
10
9
8
7
6
5
4
3
2
1
0
12
ND
ND
ND
ND
ND
ND
ND
ND
Dec-04
Mar-05
Jun-05
Sep-05
Nov-05
Mar-06
Jun-06
Sep-06
Dec-06
Sampling Event Date

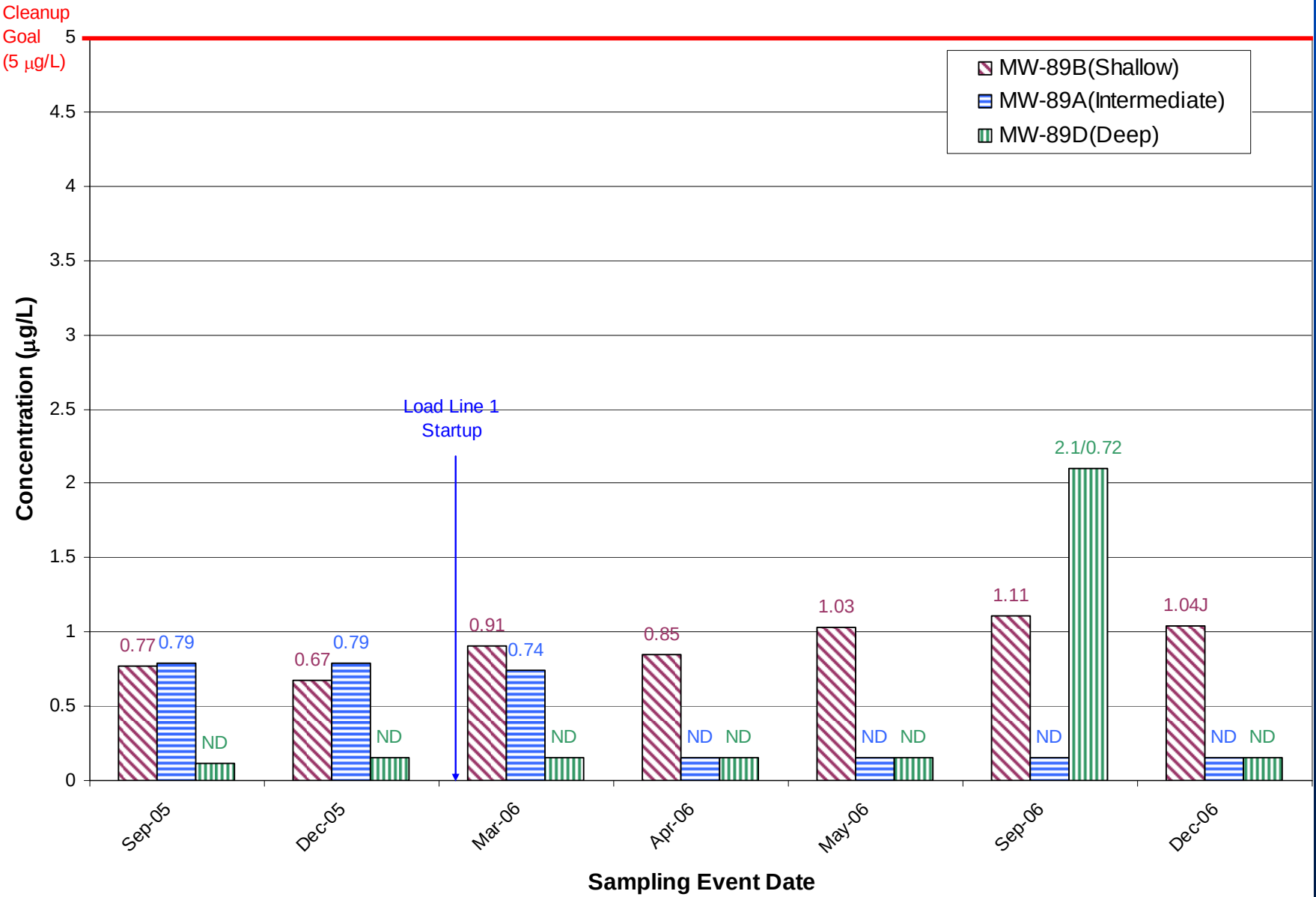

Historical Detections of TCE for Surface Water Location SW-12
SW-12
Concentration (µg/L)
5
4
3
2
1
0
0.151
0.84
1.6
1.2
1.42
0.93
1.77
29-Nov-04
20-Mar-05
12-Jun-05
18-Sep-05
30-Nov-05
27-Mar-06
19-Jun-06
Sampling Event Date


Historical Detections of TCE for Monitoring Well Cluster 79
Cleanup Goal (5 µg/L)
MW-79B (Shallow)
MW-79A (Intermediate)
Load Line 1 Plant Start-up
Concentration (µg/L)
Sampling Event Date
Sep-05
Dec-05
Mar-06
Apr-06
May-06
Sep-06
Dec-06
3.3
3.02
2.39
1.83
1.07
0.57/0.54
ND
0
0.5
1
1.5
2
2.5
3
3.5
4
4.5
5

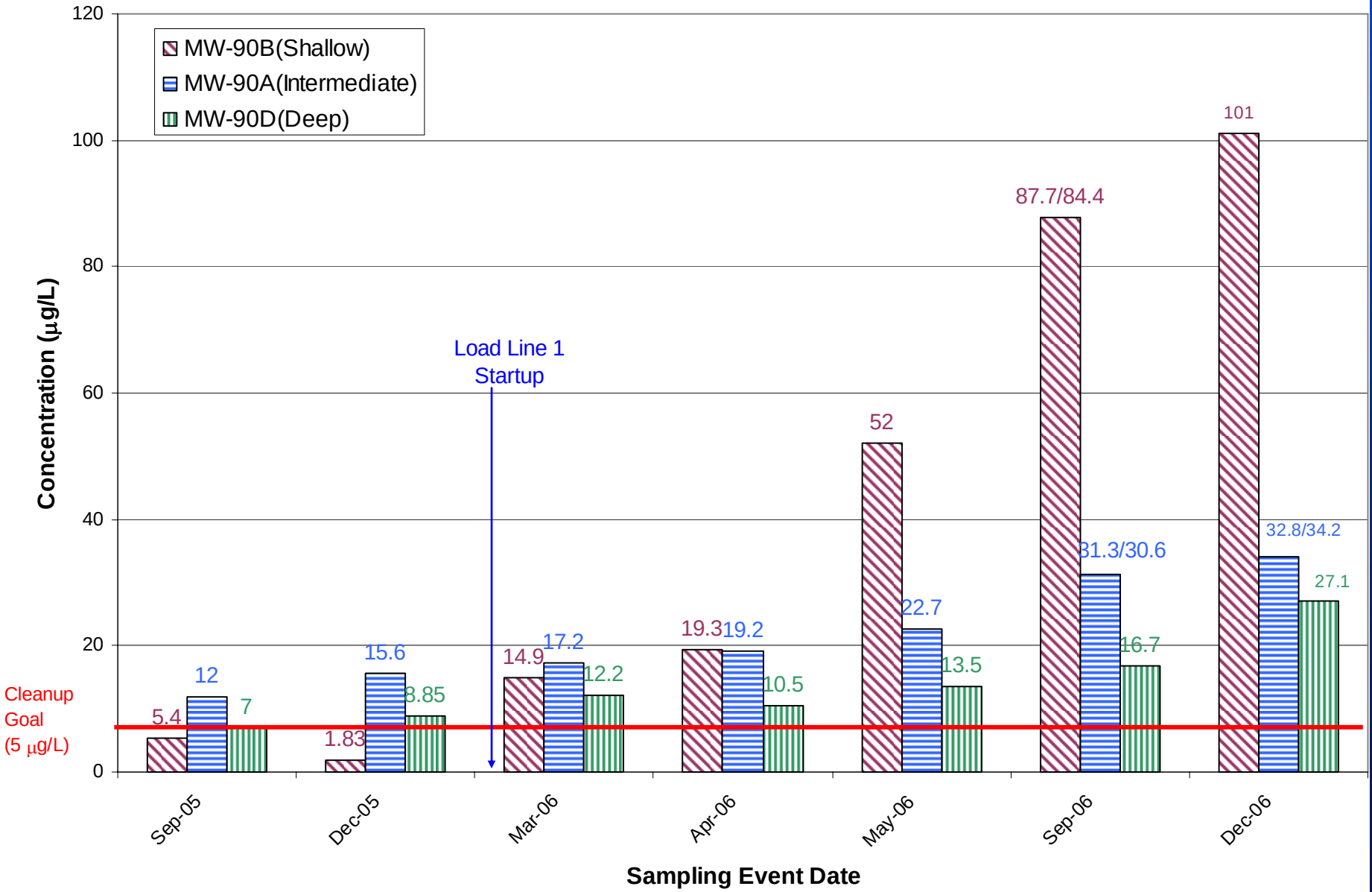
Historical Detections of TCE for Monitoring Well Cluster 80



Historical Detections of TCE for Monitoring Well Cluster 89



Historical Detections of TCE for Monitoring Well Cluster 90



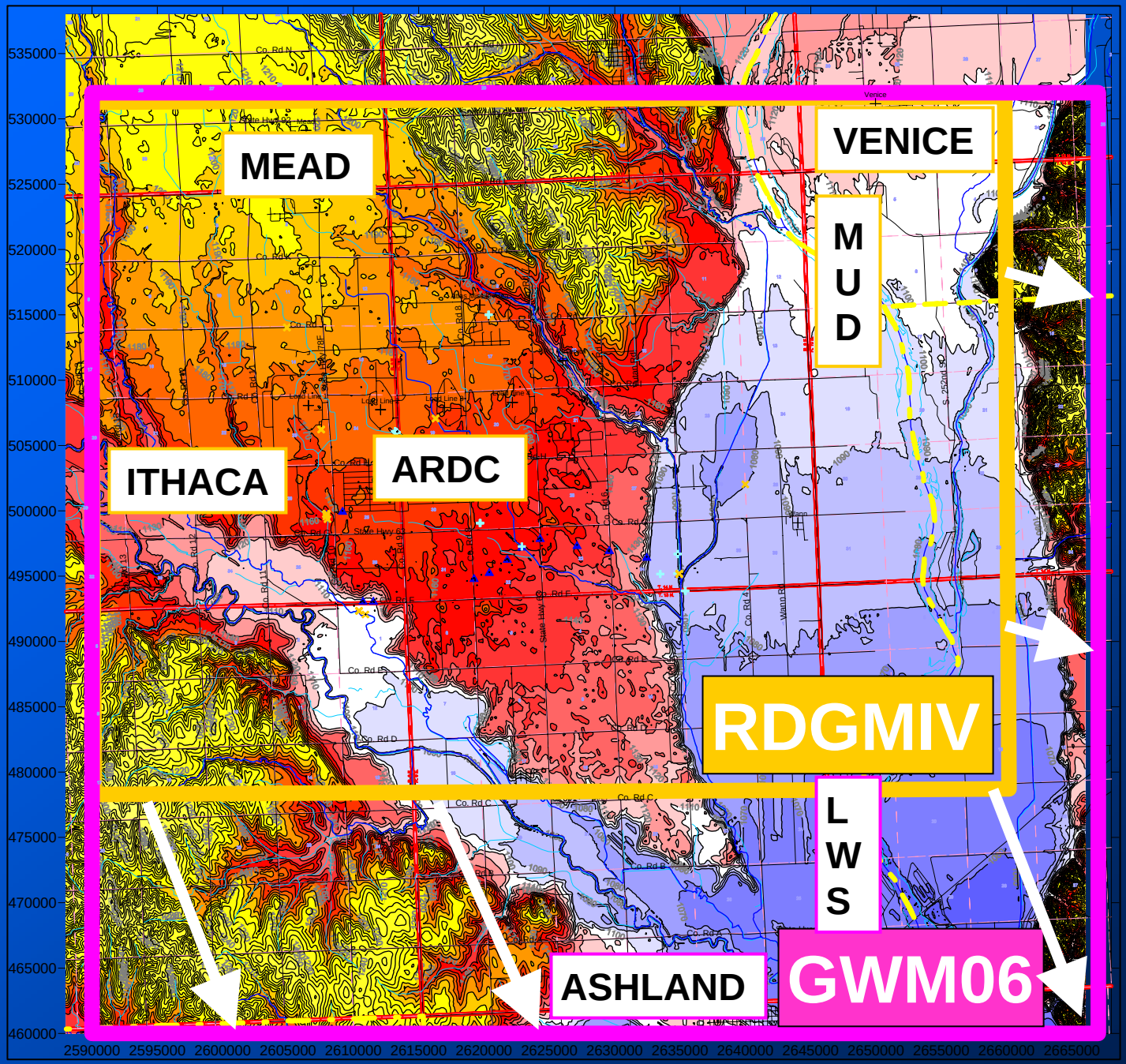
2006 Groundwater Model

- Model is currently under review by the Regulators

- 2006 GWM contains revisions based on:
  - Regulatory comments on RDGM IV (2004)
  - New site-wide information

Model Updates

- Expansion of the model area by 50% (from 135 sq. miles to 200 sq. miles).
- Conversion of model coordinates from North American Datum (NAD) 1927 to NAD 1983.
- Revision of all surfaces (bedrock, loess, etc.) using new stratigraphic data from new EWs, MWs, and irrigation wells.


MEAD
VENICE
MUD
ITHACA
ARDC
RDGMIV
LWS
ASHLAND
GWM06
535000
530000
525000
520000
515000
510000
505000
500000
495000
490000
485000
480000
475000
470000
465000
460000
2590000
2595000
2600000
2605000
2610000
2615000
2620000
2625000
2630000
2635000
2640000
2645000
2650000
2655000
2660000
2665000

Model Updates (Cont.)

- Addition of the Lincoln Water Systems - Ashland well field (Metropolitan Utility District wells were added in RDGMIV and have carried over into the 2006 GWM).

- Update of irrigation wells using DNR registration database.

Model Updates (Cont.)

- Simulation of evapotranspiration in Platte River Valley to accommodate growing season groundwater level fluctuations.
- Revised hydraulic conductivity values based on new observation wells installed at EW-4, EW-6, and EW-9 in Fall 2006.
- More detailed hydraulic conductivity distribution (rather than uniform value used in RDGMIV) based on March 2006 potentiometric surface.

Model Updates (Cont.)

- Improved simulation of surface water/ groundwater interaction based on USGS flow measurements.

- New potentiometric surfaces for March and October 2006 based on 24 surface water and 250 groundwater measurements from an area-wide coordinated effort between CENWK, USGS and LPNNRD.

Model Updates (Cont.)

- **Calibration: comparison of measured water levels to model-simulated water levels**
- **Improvement of calibration from 1.9% in RDGMIV to 0.6% in GWM06 (industry standard is <10%).**
- **Rigorous long term transient calibration based on first five years of the FNOP extraction system pumping.**
- **Short-term transient calibration based on December 2006 FNOP extraction system shutdown tests.**

Model Updates (Cont.)

- **Extensive additional characterization of eastern plume based on direct-push data collected in Fall 2005 and Spring 2006; as well as data collected as part of the site-wide GMP.**

- **Rigorous history matching of plume development from 1960s to 2006.**

Model Updates (Cont.)

- **Rigorous sensitivity analyses:**
  - Hydraulic conductivity of model layers 2 and 3
  - Evapotranspiration rate and extinction depth
  - Recharge rate

Model Updates (Cont.)

- **Sensitivity analyses (cont.):**
  - **Vertical anisotropy ratio of layer 1, and layers 2 and 3**
  - **River conductance of the Platte River, the Elkhorn River, and Wahoo Creek**
  - **Drain conductance of agriculture drain tiles**
  - **Drain conductance of Silver Creek, Clear Creek and Johnson Creek**
  - **General head boundary conductance**

Model As An Evaluation Tool

- Containment Evaluation
- Management of System Operation
  - Most Effective Pumping Distribution
  - Evaluate Potential Extraction System Modifications
- Transport Predictions
- Basis for System Optimization
- Evaluation of alternatives for focused extraction

SUMMARY OF RISK ASSESSMENT WORK

Purpose

- Summarize evaluated risks at NOP
- Summarize risks that have not yet been completely evaluated

ACRONYMS

- BLRA = Baseline Risk Assessment
- RDX = hexahydro-1,3,5-trinitro-1,3,5-triazine
- HMX = octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine
- TNB = trinitrobenzene
- DNB = dinitrobenzene
- TNT = trinitrotoluene
- DNT = dinitrotoluene

ACRONYMS

- NT = nitrotoluene
- Tetryl = 2,4,6-trinitrophenyl-N-methylnitramine
- TCE = trichloroethylene or trichloroethene
- ROD = Record of Decision
- VOC = Volatile Organic Compound
- MCL = Maximum Contaminant Level – i.e. safe drinking water level
- GW = groundwater

RISK ASSESSMENT DOCUMENTS

Risk assessment work completed to date can be found in the following documents:

- OU1 BLRA
- OU2 BLRA
- OU3 BLRA
- WES Plant Uptake Study
- Over 1500 pages combined

EVALUATED MEDIA

- Evaluated risk based on possible exposure to contamination in:
  - Soil (OU1, OU3)
  - Groundwater (OU2, OU3)
  - Surface Water (OU3)
  - Sediment (OU3)
  - Consumption of fish/vegetables (OU1, OU3)

EVALUATED CHEMICALS

- **Remedial Investigations looked at the full suite of:**
  - **Volatiles (TCE)**
  - **Semi-volatiles (PCBs)**
  - **Explosives (RDX, TNT, HMX)**
  - **Metals (Lead, Antimony)**
- **Majority of chemicals ruled out**
  - **No detections**
  - **Below accepted screening levels**

EXPOSURE TO CONTAMINATED SOIL

- Cancer and Non-Cancer effects
- Assumed On-site Residential Scenario – i.e. adult & child living on-site in contaminated areas
  - Incidental ingestion of soil
  - Dermal contact with soil
  - Ingestion of home-grown vegetables
  - Inhaling dust (soil) while tilling, planting, or harvesting

EXPOSURE TO CONTAMINATED SOIL

- Possible risk to on-site workers (non-residential) were also evaluated
- For explosives, risk to on-site residents was greater– so those results were used for decision-making
- For antimony, risk to workers drove decision making

RESULTS OF SOIL RISK ASSESSMENTS

- Risk Assessments showed explosives and metals (antimony) contamination in soil posed an unacceptable health risk
- Clean-up action required

- Based on the risk results, clean-up goals for explosives and antimony in soil were established

SOIL CLEAN-UP GOALS

Chemical of Concern	Goal – ppm (mg/Kg)
HMX	1715.2
RDX	5.8
TNB	1.7
DNB	3.4
TNT	17.2
DNT	0.9
NT	343.0
Tetryl	343.0
Antimony	31.0

SOIL REMEDIAL ACTIONS

- **OU1: Soil with explosives at levels above the clean-up goals was excavated and incinerated (1997)**
- **OU3: Non-Time Critical Removal Action of Antimony (2007)**

EXPOSURE TO CONTAMINATED GW

- Cancer and Non-Cancer effects of explosives and VOC contamination in groundwater
- Assumed On-site Residential Scenario – i.e. adult & child living on-site in contaminated areas
  - Ingestion of groundwater as drinking water
  - Dermal contact with groundwater (shower)
  - Ingestion of home-grown vegetables irrigated with groundwater
  - Inhaling VOC vapors during shower

EXPOSURE TO CONTAMINATED GW

- Possible risk to on-site workers (non-residential) was also evaluated

- Risk to on-site residents was greater – so those results were used for decision-making

RESULTS OF GW RISK ASSESSMENT

- Contamination present in groundwater posed an unacceptable health risk
- Clean-up action required
- Established clean-up goals for explosives and VOCs in groundwater were using MCL or Health Advisory

GW CLEAN-UP GOALS

Chemical of Concern	Goal – ppb
TCE	5.0
RDX	2.0
TNB	0.778
TNT	2.0
2,4 DNT	1.24
Methylene Chloride	5.0
1,2 dichloropropane	5.0

GROUNDWATER REMEDIAL ACTION

- Extraction wells and treatment to contain groundwater above the clean-up goals to prevent future migration (1998-present)
- Focused GW extraction
- Groundwater treated prior to discharge
- Alternate water supply to residents

EXPOSURE TO SURFACE WATER

- Cancer and Non-Cancer effects of explosives and VOC contamination in surface water
- Assumed adult & child recreational exposure
  - Incidental ingestion of surface water
  - Dermal contact with surface water
  - Ingestion of fish from surface water

SURFACE WATER RISK ASSESSMENT RESULTS

- Results show current levels of contamination present in surface water (Johnson Creek) do not pose an unacceptable health risk
- No further action necessary regarding surface water
- But – USACE will continue to monitor contaminant levels in the surface water to watch for any significant changes

EXPOSURE TO SEDIMENTS

- Exposure to contaminated stream sediments
- Adult and child fisherman scenarios
  - Incidental ingestion of sediment
  - Dermal exposure
- Results show current levels of contamination present in sediment (Johnson Creek) do not pose an unacceptable health risk

HUMAN CONSUMPTION CONTAMINATED FOOD

- Evaluated uptake of contaminants from food grown in contaminated areas
  - Grown in contaminated soil
  - Irrigated with contaminated GW
  - Fish tissue
- No accumulation of contaminants in vegetables and fish
- Therefore no risk for human consumption

ECOLOGICAL RISK ASSESSMENT

- Evaluate possible effects of contaminated soil, groundwater and surface water on the environment
- Includes sensitive or endangered species:
  - Minnow
  - Plant/flowers
  - Insects

ECOLOGICAL RISK ASSESSMENT

- Ecological Risk Assessment performed as in OU1 and OU3
- Conclusions showed no unacceptable threat to the environment

EXPOSURE PATHWAYS NOT FULLY EVALUATED

- Inhalation of vapors due to irrigation - identified in 5 Year Review
- Vapor Intrusion – investigation work plan being prepared
- Animal health risk assessment - Human health risk takes precedence in CERCLA law and animal health assessments are not required
- Military munitions - previously evaluated, but subject to recurring review

Next RAB Meeting

- **Future RAB Topics**
  - **What topics are of interest to the community?**
  - **Tell us what you would like us to present at future RAB meetings**
- **Next RAB Meeting: July 2007. Specific date TBD.**